

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES  
(Attorney Docket No. 005127.00222)**

In re U.S. Patent Application of	)	
John T. Stiles	)	
	)	Art Unit: 3714
Application No. 10/806,508	)	
	)	Examiner: Jasson H. Yoo
Filed: March 23, 2004	)	
	)	Confirmation No. 2719
For: SYSTEM FOR DETERMINING	)	
PERFORMANCE CHARACTERISTICS	)	
OF A GOLF SWING	)	

**BRIEF ON APPEAL**

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This Appeal Brief is being filed in support of Applicants' February 9, 2009 Notice of Appeal. Appeal is taken from the Final Office Action dated September 9, 2008. Please charge any necessary fees in connection with this appeal brief to our Deposit Account No. 19-0733.

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**I. REAL PARTY IN INTEREST**

The owner of this application, and the real party in interest, is Nike, Inc.

**II. RELATED APPEALS AND INTERFERENCES**

There are no related appeals or interferences.

### **III. STATUS OF CLAIMS**

Claims 1-13 remain in the application. Claims 14-65 were previously withdrawn from consideration. All pending claims (1-13) stand rejected. Applicant is appealing all pending claims (1-13). All claims are shown in the attached appendix, including claims 14-65 which were previously withdrawn from consideration.

**IV. STATUS OF AMENDMENTS**

There are no amendments subsequent to the Final Office Action dated July 25, 2008.

## V. SUMMARY OF CLAIMED SUBJECT MATTER

In making reference herein to various portions of the specification and drawings in order to explain the claimed invention (as required by 37 CFR §41.37(c)(1)(v)), Applicants do not intend to limit the claims. All references to the specification and drawings are illustrative unless otherwise explicitly stated.

Aspects of the claimed subject matter relate to golf clubs. Specifically, aspects of the claimed subject matter relate to “methods and systems for analyzing performance characteristics of a golf swing.” (Paragraph 1, lines 1-2). “The disclosed golf clubs may be self contained and include sensors and transmitters located within the golf clubs. As a result, the golf clubs can be used during a round of golf and do not interfere with the golfer. In certain embodiments, the disclosed golf clubs wirelessly transmit golf swing characteristic data to a portable device, such as a personal digital assistant (PDA) or watch.” (Paragraph 6, lines 2-6). There are two (2) pending independent claims (claims 1 and 11).

Independent claim 1 is directed to a “self contained instrumented golf club.” The apparatus comprises two elements. The first element is “a first accelerometer module *removably mounted in* a head of the golf club.” (emphasis added). Figure 2 shows an instrumented golf club 200 that includes a removable accelerometer module 212 within head 208. Briefly, “[p]roviding a removable accelerometer in the head of the golf club has several advantages, such as not interfering with the aerodynamics of the club during the swing being measured, protecting against the environmental elements or damage every time a user places the club into a golf bag, and/or allowing a user to utilize another head/shaft combination without requiring the movement

and alignment of the accelerometer each time.” (*see* Paragraphs 28-30, generally and Applicant’s Response dated January 9, 2009, page 12).

The second element is “a second accelerometer module mounted *in a shaft* of the golf club.” (emphasis added). Looking again to Figure 2, an accelerometer 204 is provided in the shaft 206 of golf club 200. As indicated in the specification, “accelerometer module 204 may be used to measure acceleration of the shaft 206.” (Paragraph 27, lines 5-6).

Independent claim 11 is directed towards “a computer-readable medium containing computer-executable instructions for causing a transmission module embedded within a golf club to perform” a method. Figure 1 shows a golf swing analysis system 100 comprises a “golf club 110 [that] includes internal sensors (shown in Figure 2) and wirelessly transmits data to a portable computer device 120.” (Paragraph 25, lines 2-3). The first element of claim 11 is “receiving first golf swing data from a first accelerometer module removably mounted in a head of the golf club.” Figure 2 shows an instrumented golf club 200 that includes a removable accelerometer module 212 within head 208.

The second element of claim 11 recites that “receiving second golf swing data from a second accelerometer module mounted in a shaft of the golf club.” Looking again to Figure 2, an accelerometer 204 is provided in the shaft 206 of golf club 200. As indicated in the specification, “accelerometer module 204 may be used to measure acceleration of the shaft 206.” (Paragraph 27, lines 5-6).

The third element of claim 11 recites “transmitting the first and second golf swing data.” The golf club 110 “wirelessly transmits data to a portable computer device 120.” (Paragraph 25, line 3).



Applicants further wish to provide a summary of the subject matter claimed in dependant claims 2 and 6. Specifically, claim 2 depends from claim 1 and further recites “wherein the weight of the first accelerometer and the second accelerometer do not change the balance or center of gravity of the club.” As provided in the specification, “[g]olf club 200 may also be configured so that the weights of the included components do not change the balance or center of gravity of the club. Golf club 200 may be a wood, iron, putter or specialty club.” (Paragraph 30, lines 2-5). Claim 6 also depends from claim 1 and further recites that the instrumented golf club of claim 1 “include[s] an antenna that comprises a ferrule that connects the head of the golf club to the shaft of the golf club.” Figure 2 shows ferrule 216 which may be “used as an antenna.” (Paragraph 29, line 5).

**VI. GROUND OF REJECTION TO BE REVIEWED ON APPEAL**

- Whether claims 1-2, 5, and 10-11 are unpatentable under 35 USC §103(a) over Storek (US 2004/0259651) in view of Petrash (US 3,226,704).
- Whether claims 7-8 and 12 are unpatentable under 35 USC §103(a) over Storek (US 2004/0259651) as applied to claims 1 and 11, and further in view of Gedney et al. (US 5,209,483).
- Whether claims 9 and 13 are unpatentable under 35 USC §103(a) over Storek (US 2004/0259651) in view of Petrash (US 3,226,704) and in view of Gedney et al. (US 5,209,483) as applied to claims 7 and 12, and further in view of McTeigue (US 5,221,088).
- Whether claim 6 is unpatentable under 35 USC §103(a) over Storek (US 2004/0259651) in view of Petrash (US 3,226,704) as applied to claim 1, and further in view of Evans (US 3,792,863) as supported by Lagerblade (US 1,444,842).

## VII. ARGUMENT

### A. Rejection under 35 USC §103(a)

#### Claims 1-2, 5, and 10-11

Claims 1-2, 5, and 10-11 are rejected as being allegedly unpatentable under 35 USC §103(a) over Storek (US 2004/0259651) in view of Petrash (US 3,226,704). Applicants respectfully request reversal of the rejection in view of the following.

Applicants respectfully submit that the rejection is improper for at least two reasons. First, neither Storek nor Petrash, either individually or in combination, teach at least “a first accelerometer module removably mounted in a head of the golf club” as recited in independent claim 1 (or receiving golf swing data from an “accelerometer module removably mounted in a head of the golf club” as recited in independent claim 11). Second, the Examiner’s reliance on *In re Dulberg* is contrary to the M.P.E.P. and applicable law.

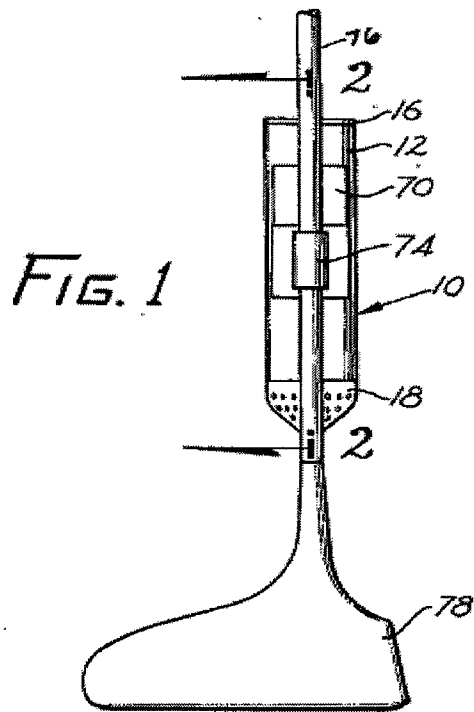
#### 1. The teachings of Storek and Petrash

The Examiner admits Storek (the primary reference) does not teach or suggest a removably mounted accelerometer in the head of a golf club. (*See, e.g.*, Office Action dated September 9, 2008, page 2, admitting that Storek “fails to teach the accelerometer is removable”). The secondary reference, Petrash, also does not teach, suggest, or disclose a removable accelerometer removably mounted in the head of the golf club. First, Applicants respectfully submit that Petrash does not teach a removable accelerometer. As recited in Petrash, “[a] bifurcated mounting bracket 70 is *rigidly affixed* to the casing by a *weldment* 72 and is *engageable* by a clip 74 *to secure* the casing 12 to the shaft 76 of a golf club 78.” (Petrash, Col. 2, lines 31-34, emphasis added). In addition to the statements above, there are no further statements which indicate that the accelerometer may be removed once assembled. Indeed, any

movement of the accelerometer with respect to the shaft is described as being “rotated upon the shaft,” however, there is not any indication that it may be removed. (see, Col. 1, lines 29-30). Indeed, if the clip was slidably removable from the casing, there would be some indication within the drawings or in the specification enabling one skilled in the art on how to make or use a clip that could remain on during a backswing, but somehow be removable upon receiving a similar-directed force from a user or machine. In this regard, Petrash is silent in relation to any teachings of removing the clip or the casing. For at least this reason, Applicants respectfully request reversal of the rejection.

If, however, the Board finds that Petrash does, in fact, suggest a removable accelerometer, then Petrash explicitly states that the accelerometer is on the *exterior of the shaft* of the golf club and thus must be removed from the *exterior* of the club. Indeed, as discussed in more detail below, the accelerometer of Petrash asserted to be “removable” is located *externally on the shaft*, and thus is not mounted in the club head. Furthermore, the shaft-mounted accelerometer could not be modified to be removably placed in the head of the golf head.

The Examiner cites element 10 of Figure 1 of Petrash as showing a detachable accelerometer. As shown in Figure 1 of Petrash (reproduced below), Petrash’s accelerometer is not *in* the head of the club. Rather, as recognized by the Examiner it is attached by “*a clip* ([element] 74 in Figs. 1 and 2)” to the shaft of the golf club. (Office Action dated September 9, 2008, p.3, emphasis added).



Further, there is no teaching, suggestion, or disclosure anywhere in the art of record on how one skilled in the art could modify the clip holding the accelerometer to the outer perimeter of the shaft of Petrash to be placed *in* the head of the golf club.<sup>1</sup> First, merely utilizing a clip to attach an accelerometer to the exterior of a shaft is drastically different than removably placing an accelerometer *in* the head of the club, as evidenced by the many advantages discussed below, among others.

Indeed, providing a removable accelerometer in the head of the golf club has several advantages that are not disclosed, taught, or even suggested by the prior art of record, such as not interfering with the aerodynamics of the club during the swing being measured, protecting against the environmental elements or damage every time a user places the club into a golf bag, and/or allowing a user to utilize another head/shaft combination without requiring the movement and alignment of the accelerometer each time. In fact, as further indicated by the Specification:

In one embodiment of the invention, all of the sensors are located within golf club 200 so as to not interfere with the aerodynamics of the club. Golf club 200 may also be configured so that the weights of the included components do not change the balance or center of gravity of the club. Golf club 200 may be a wood, iron, putter or specialty club.

(Specification, para. 30, lines 1-5, emphasis added).

In this regard, claim 2, which depends from claim 1 recites a golf club wherein “the weight of the first accelerometer and the second accelerometer do not change the balance or

<sup>1</sup> In fact, as seen in Fig. 1 of Petrash, the accelerometer 10 is larger than the head of the club that it’s alleged to be manipulated to fit in.

center of gravity of the club.” Clearly, having an external accelerometer off-center from to the exterior of the shaft (as taught by Petrash) would alter the balance and center of gravity of the club. Despite this, the Examiner’s rejection merely states that “it would have been obvious to one of ordinary skilled in the art to design the attachments of the accelerometers do not change the center of gravity of [sic] club.” (Office Action dated September 9, 2008, p3). This statement, however, directly contradicts the same reference cited against the rejected claims. Indeed, the accelerometer attached to the shaft of Petrash must, by its very location, alters the balance and center of gravity of the club. In this regard, the only way the accelerometer is disclosed as being mounted is by being positioned off-center with respect to the shaft.

Applicants, therefore, respectfully submit that the Examiner’s rationale is merely a conclusory statement without support – which contradicts the Examination Guidelines published by the PTO on October 10, 2007. The Examination Guidelines make it clear that conclusory statements of the type used in the Final Office Action are not sufficient to support an obviousness rejection under 35 U.S.C. § 103. Specifically, when referencing KSR, the PTO noted:

The Court quoting *In re Kahn* stated that “[R]ejections on obviousness cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.”

(72 Fed. Reg. 175 at 57528-57529). Therefore, each of the §103 rejections must at least demonstrate that each and every element recited in the rejected claims is disclosed in the prior art, and must provide some articulated reasoning with some rational underpinning to support the finding of obviousness. Indeed, the *KSR* Court indicated that the *Graham* factors set forth in *Graham v. Deere*, 383 U.S. 1 (1966) still control any obviousness determination. In *Graham*, the Supreme Court held that, when assessing whether a claim satisfies the condition of patentability

required by Section 103, the courts and the Patent and Trademark Office must make “several basic factual inquiries.” In particular, these inquiries include (1) “the scope and content of the prior art,” (2) “differences between the prior art and the claims at issue,” and (3) “objective evidence of nonobviousness.” *Graham v. Deere*, supra at 17. As discussed above, there are several differences between the prior art and the claims and issue, and the closest alleged prior art as teaching this element, which is over 50 years old, provides objective evidence that several claim limitations are not in fact obvious. Applicants respectfully submit that neither Storek, Petrash or any other art of record, whether applied individually or in combination, teach at least “a first accelerometer module removably mounted in a head of the golf club” or a golf club wherein “the weight of the first accelerometer and the second accelerometer do not change the balance or center of gravity of the club.” For at least these reasons, Applicants respectfully request reversal of the rejection.

## **2. The Examiner’s Application of *In re Dulberg***

Applicants respectfully disagree with the Examiner’s reliance on *In re Dulberg*. Specifically, the Office Action cites *In re Dulberg* and alleges that “it is obvious to have elements of an apparatus separable.” (Office action dated September 9 2008, page 3). The only support for this conclusory statement that it’s obvious to have the elements separable is the citation to *In re Dulberg*. Although M.P.E.P. §2144.04 (which sets forth the applicability of *In re Dulberg*) allows an Examiner to make an obviousness determination based only on “sufficiently similar” caselaw, it also states that “[i]f the applicant has demonstrated the criticality of a specific limitation, it would *not be* appropriate to rely solely on case law as the rationale to support an

obviousness rejection. (emphasis added). Indeed, at least one court has directly addressed this exact issue. As decided by the court in *For Your Ease Only v. Natural Science Industries Ltd.*:

because the removability limitation is critical to the [patent-at-issue], it would not be appropriate, under MPEP 2144.04, to rely solely on *Dulberg* for an obviousness rejection. Therefore, *Dulberg* alone does not raise a substantial question regarding the validity of the [patent-at-issue].

233 F.Supp.2d 988, 993 (N.D. Ill. 2002). Similar to the patent-at-issue in the above cited decision, one of the differences between the subject matter of the rejected claims and the art at issue is the novelty of a removable accelerometer in the head of the golf club, and another difference is that “the weight of the first accelerometer and the second accelerometer do not change the balance or center of gravity of the club.” In view of the foregoing, Applicants respectfully submit that the Office Action’s reliance on *In re Dulberg* is incorrect and respectfully request the reversal of the rejection. The Advisory Action did not address the improper application of *In re Dulberg* or argue against the “criticality of a specific limitation.” Rather, the Examiner stated that “the supporting rejection was made in view of Storek as supported by *In re Dulberg*; and not in view of Petrash. (Advisory Action dated January 9, 2009, p. 3). Therefore, the Examiner has not provided:

- clarification whether Petrash is no longer being utilized in the rejection as indicated in the Advisory Action, specifically because Applicants are unable to locate an asserted §103 rejection in which Petrash is not being asserted;
- whether the Examiner is arguing against the “criticality” of the limitation-at-issue; and
- whether there is any other support, aside from *In re Dulberg*, that “it is obvious to have elements of an apparatus separable.”



**Claims 7-8 and 12**

Claims 7-8 ultimately depend from claim 1 and claim 12 depends from claim 11. Applicants respectfully submit that the art of record does not teach, disclose, or suggest the subject matter of claims 1 and 11, and, therefore, submit that claims 7-8 and 12 are allowable over the art of record for at least the reasons discussed above in relation to claims 1 and 11. In view of the foregoing, Applicants respectfully request reversal of the rejection.

**Claims 9 and 13**

Claim 9 ultimately depends from claim 1 and claim 13 ultimately depends from claim 11. Applicants respectfully submit that the art of record does not teach, disclose, or suggest the subject matter of claims 1 and 11, and, therefore, submit that claims 9 and 13 are allowable over the art of record for at least the reasons discussed above in relation to claims 1 and 11. In view of the foregoing, Applicants respectfully request reconsideration and withdrawal of the rejection.

**Claim 6**

Claim 6 is rejected under 35 U.S.C. § 103(a) as being allegedly being unpatentable over Storek (US 2004/0259651) in view of Petrash as applied to claim 1, and further in view of Evans (US 3,792,863) as supported by Lagerblade (US 1,444,842). The Applicants respectfully requests reversal in view of the Remarks below.

The Office Action asserts that:

Storek in view Petrash and in view of Evans significantly discloses the claimed invention as discussed above but fails to teach a ferrule that connects the head of the golf club to the shaft of the golf club. Nevertheless such modification is notoriously well known in the art. Storek in view of Petrash and in view of Evans discloses that parts of the golf club are used as an antenna. A ferrule of the golf club is considered as a part of the golf club. A ferrule is commonly used to connects the head of the golf club to the shaft of the golf club in order to secure the head of the golf club to the shaft of the golf club. Furthermore, the ferrule prevents the shaft from splitting. This is supported by Lagerblade (lines 102-108). Therefore it would have been obvious to modify Storek in view of Evans instrumented golf club, and incorporate Lagerblade's ferrule in order to prevent the shaft from splitting.

(Office Action dated September 9, 2008, p. 8). Applicants disagree with the above statement. In fact, as characterized by the cited passage above, Lagerblade merely shows a ferrule that may be used to prevent a shaft from splitting. Applicants do not dispute that Lagerblade discloses a ferrule for a golf club. Claim 6, however, does not merely recite a golf club having a ferrule. Rather, claim 6 recites "an antenna that comprises a ferrule that connects the head of the golf club to the shaft of the golf club." (emphasis added). Neither Lagerblade nor any other art of record, however, actually teaches, discloses, or otherwise suggests an antenna that comprises a ferrule connecting the head of the club with the shaft. For example, in an embodiment that incorporates the antenna within the ferrule, a different head/shaft combination may be used without requiring rewiring or attachment of an antenna within a new shaft. Applicants respectfully submit that the subject matter recited in dependent claim 6 is drastically different


that utilizing only the shaft as an antenna as disclosed in the art of record. In view of the foregoing, Applicants respectfully reversal of the rejection in respect to claim 6.

Accordingly, for at least the above reasons, Applicants respectfully request reconsideration and reversal of the rejections in regards to the pending claims.

The rejections contained in the Action of September 9, 2008 should be reversed for at least the reasons recited above. Reversal of the rejections is respectfully requested.

Respectfully submitted,

Dated: April 9, 2009

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**CLAIMS APPENDIX**

1. A self contained instrumented golf club, the golf club comprising:  
a first accelerometer module removably mounted in a head of the golf club; and  
a second accelerometer module mounted in a shaft of the golf club.
2. The instrumented golf club of claim 1, wherein the weight of the first accelerometer and the second accelerometer do not change the balance or center of gravity of the club.
3. The instrumented golf club of claim 2, wherein the head of the golf club is a wood.
4. The instrumented golf club of claim 2, wherein the head of the golf club is an iron.
5. The instrumented golf club of claim 1, wherein the first accelerometer module senses acceleration along three orthogonal axes.
6. The instrumented golf club of claim 1, further including an antenna that comprises a ferrule that connects the head of the golf club to the shaft of the golf club.
7. The instrumented golf club of claim 1, further including an impact module configured to sense the location of impact with a golf ball.
8. The instrumented golf club of claim 7, wherein the impact module comprises an array of strain gauges.
9. The instrumented golf club of claim 7, further including a grip pressure sensor.
10. The instrumented golf club of claim 1, further including a transmission module that wirelessly transmits golf swing data.

11. A computer-readable medium containing computer-executable instructions for causing a transmission module embedded within a golf club to perform the steps of:

receiving first golf swing data from a first accelerometer module removably mounted in a head of the golf club;

receiving second golf swing data from a second accelerometer module mounted in a shaft of the golf club; and

transmitting the first and second golf swing data.

12. The computer-readable medium of claim 11, further including computer-executable instructions for causing the transmission module to perform the steps of:

receiving ball impact location data from an impact module; and

transmitting the ball impact location data.

13. The computer-readable medium of claim 12, further including computer-executable instructions for causing the transmission module to perform the steps of:

receiving grip pressure data from a grip pressure sensor; and

transmitting the grip pressure data.

14. (Withdrawn) A user interface for displaying golf swing performance information of a golfer, the user interface comprising:

a first section displaying a measured first golf swing parameter at a location along a bar to indicate a relationship between a value of the measured first golf swing parameter and a preferred value of the first golf swing parameter.

15. (Withdrawn) The user interface of claim 14, further including:

a second section displaying a measured second golf swing parameter at a location along a bar to indicate a relationship between a value of the measured second golf swing parameter and a preferred value of the second golf swing parameter.

16. (Withdrawn) The user interface of claim 15, wherein the preferred values of the first and second golf swing parameters correspond to a golf swing selected by a user.
17. (Withdrawn) A method of providing golf swing data to a golfer; the method comprising:
  - (a) receiving golf swing data from a self contained instrumented golf club;
  - (b) displaying in real time on a portable computer device at least some of the golf swing data in relation to preferred golf swing data.
18. (Withdrawn) The method of claim 17, further including:
  - (c) receiving a indication that a golf swing is a preferred golf swing: and
  - (d) storing golf swing data corresponding to the preferred golf swing as preferred golf swing data.
19. (Withdrawn) The method of claim 17, wherein (a) comprises receiving a wireless signal.
20. (Withdrawn) The method of claim 17, wherein (b) comprises displaying a first golf swing parameter along a bar that indicates a deviation from a preferred first golf swing parameter.
21. (Withdrawn) The method of claim 20, wherein the first golf swing parameter comprises tempo.
22. (Withdrawn) The method of claim 20, wherein the first golf swing parameter comprises grip pressure.
23. (Withdrawn) The method of claim 20, wherein the first golf swing parameter comprises shaft energy transfer.
24. (Withdrawn) The method of claim 20, wherein the first golf swing parameter comprises club head speed.

25. (Withdrawn) The method of claim 20, wherein the first golf swing parameter comprises club face angle.
26. (Withdrawn) The method of claim 20, wherein the first golf swing parameter comprises a swing path.
27. (Withdrawn) The method of claim 20, wherein the first golf swing parameter comprises an impact location.
28. (Withdrawn) The method of claim 17, further including:  
receiving weight transfer data from a weight transfer module; and  
displaying in real time on the portable computer device the weight transfer data in relation to preferred weight transfer data.
29. (Withdrawn) An instrumented golf club system comprising:  
a self contained instrumented golf club, the golf club comprising:  
a first accelerometer module mounted in a head of the golf club;  
a second accelerometer module mounted in a shaft of the golf club;  
a wireless transmission module that transmits data from the first and second accelerometers; and  
a portable computer device that receives the data transmitted by the wireless transmission module.
30. (Withdrawn) The system of claim 29, further including:  
a weight distribution module that measures a golfers weight distribution during a golf swing.
31. (Withdrawn) The system of claim 30, wherein the weight distribution module is configured to fit within a pair of golf shoes.

32. (Withdrawn) A method for determining the face angle of a golf club having a shaft, the method comprising:

- (a) detecting a start of a back swing;
- (b) detecting an impact of the golf club with a ball;
- (c) determining the golf club shaft rotational rate as a function of time at least from the start in (a) until the impact in (b); and
- (d) integrating the golf club shaft rotational rate with respect to time from the start in (a) until the impact in (b).

33. (Withdrawn) The method of claim 32, wherein (a) comprises detecting velocity with a velocity sensor.

34. (Withdrawn) The method of claim 32, wherein (b) comprises detecting a spike in an angular rate of change of the shaft of the golf club.

35. (Withdrawn) A self contained instrumented golf club, the golf club comprising a gyroscope module configured to sense at least one golf swing parameter.

36. (Withdrawn) The instrumented golf club of claim 35, wherein the gyroscope module comprises a 3-axis gyroscope.

37. (Withdrawn) The instrumented golf club of claim 35, wherein the gyroscope module comprises a micro-electromechanical system.

38. (Withdrawn) The instrumented golf club of claim 35, further including an acceleration module.

39. (Withdrawn) The instrumented golf club of claim 38, wherein the acceleration module is included within the gyroscope module.



40. (Withdrawn) The instrumented golf club of claim 35, further including an antenna that comprises a feral that connects a head of the golf club to a shaft of the golf club.

41. (Withdrawn) The instrumented golf club of claim 35, further including a transmission module that wirelessly transmits golf swing data.

42. (Withdrawn) A self contained instrumented golf club, the golf club comprising a magnetic sensor module that senses the direction of the earth's magnetic field relative to a head of the golf club.

43. (Withdrawn) The instrumented golf club of claim 42, wherein the magnetic sensor module comprises an anisotropic magnetoresistive device.

44. (Withdrawn) The instrumented golf club of claim 42, wherein the magnetic sensor module comprises a giant magnetoresistor device.

45. (Withdrawn) The instrumented golf club of claim 42, wherein the magnetic sensor module is configured to a resolve a vector corresponding to the earth's magnetic field into at least two component vectors.

46. (Withdrawn) The instrumented golf club of claim 45, wherein the magnetic sensor module is configured to a resolve the vector corresponding to the earth's magnetic field into three component vectors.

47. (Withdrawn) The instrumented golf club of claim 42, further including an antenna that comprises a feral that connects the head of the golf club to a shaft of the golf club.

48. (Withdrawn) The instrumented golf club of claim 42, further including a transmission module that wirelessly transmits golf swing data.

49. (Withdrawn) An instrumented golf club, the golf club comprising an array of electromagnetic sensors that receive electromagnetic radiation reflected from a golf ball.

50. (Withdrawn) The instrumented golf club of claim 49, wherein the electromagnetic radiation comprises radio frequency radiation.

51. (Withdrawn) The instrumented golf club of claim 49, further including a module that measures a Doppler frequency shift of the electromagnetic radiation reflected from the golf ball.

52. (Withdrawn) The instrumented golf club of claim 49, wherein at least some of the sensors in the array of electromagnetic sensors emit electromagnetic radiation.

53. (Withdrawn) The instrumented golf club of claim 49, further including an antenna that comprises a feral that connects the head of the golf club to the shaft of the golf club.

54. (Withdrawn) The instrumented golf club of claim 49, further including a transmission module that wirelessly transmits golf swing data.

55. (Withdrawn) An instrumented golf club, the golf club comprising an array of electromagnetic sensors that receive electromagnetic radiation reflected from a golf ball.

56. (Withdrawn) The instrumented golf club of claim 55, wherein the electromagnetic radiation comprises radio frequency radiation.

57. (Withdrawn) The instrumented golf club of claim 55, further including a module that measures a Doppler frequency shift of the electromagnetic radiation reflected from the golf ball.

58. (Withdrawn) The instrumented golf club of claim 55, wherein at least some of the sensors in the array of electromagnetic sensors emit electromagnetic radiation.

59. (Withdrawn) The instrumented golf club of claim 55, further including an antenna that comprises a feral that connects a head of the golf club to a shaft of the golf club.

60. (Withdrawn) The instrumented golf club of claim 55, further including a transmission module that wirelessly transmits golf swing data.

61. (Withdrawn) An instrumented golf club, the golf club comprising an array of ultrasound sensors that receive ultrasound waves reflected from a golf ball.

62. (Withdrawn) The instrumented golf club of claim 61, further including a module that measures a Doppler frequency shift of the ultrasound waves reflected from the golf ball.

63. (Withdrawn) The instrumented golf club of claim 61, wherein at least some of the sensors in the array of ultrasound sensors emit ultrasound waves.

64. (Withdrawn) The instrumented golf club of claim 61, further including an antenna that comprises a feral that connects a head of the golf club to a shaft of the golf club.

65. (Withdrawn) The instrumented golf club of claim 61, further including a transmission module that wirelessly transmits golf swing data.

**EVIDENCE APPENDIX**

None.

**RELATED PROCEEDINGS APPENDIX**

None.